

Performance Metrics for Information Technology

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Introduction to Mitretek

- **Mitretek is a private, not-for-profit information systems technology corporation established to engage in scientific, research, development, engineering, and advisory services for the U.S Government, state and local government, non-profit organizations, and others, in the public interest**

Information Technology Metrics

- **Focus on Performance Engineering for Information Technology**
- **METRICS: business, application, component and hardware resource metrics**
- **Observations of Performance Engineering practices from other engineering disciplines**
- **Need for IT Performance Metrics**
- **Recent work at Mitretek**

Focus on Performance Engineering in Information Technology

- **Current popular large system architecture built using a distributed software component architecture**
- **Distributed software components are a combination of custom-built and Commercial-Off-The-Shelf (COTS) components**
 - **DBMS, Message Queue, Transaction Monitor, Web Servers, DCOM and CORBA business components**
- **Many system integrators assemble these components with no regard to performance**

METRICS: Business, Application, Component and Hardware Resource

- **Business Metrics:** invoices per hour, claims per hour
- **Application Metrics:** table updates per hour, queries per hour
- **Software Component Metrics:** connections per minute, messages per minute, table scans per minute, index lookups per minute
- **Hardware Resource Metrics:** CPU utilization, disk I/Os, memory allocations, context switches

Performance Engineering practices from other engineering disciplines

- **Component specification standards**
 - **Engines: lbs of thrust, horsepower**
 - **Nuts and bolts: shear strength, thread standards**
 - **Containers and pipes: pounds per sq inch (psi)**
 - **Integrated circuits: clock speeds, # of gates, instructions per second**
- **Subsystem testing**
 - **Subsystems of aircraft, buildings, automobiles, space shuttles are modeled and tested before complete assembly**

Need for IT Performance Metrics

- **Distributed IT applications are frequently developed by coupling together many components and HOPING the final system will meet performance goals**
 - Initial business metric performance requirements, e.g. response times, service level agreements
 - No software component performance specs
 - No software component stress testing
 - No subsystem stress testing
- **Result: expensive application redesign and resizing of hardware after deployment to retrofit business performance requirements**

Recent work at Mitretek

- **Mitretek has been testing distributed system performance for the last 3 years**
- **Mitretek Sponsored Research projects:**
 - **Enterprise-wide Client/Server Architectures**
 - **Distributed Application Management**
 - **Web Transaction Processing**

Why is Performance an Issue Today?

- Performance has always been an issue
- Migration from legacy systems to client/server architecture resulting in performance becoming a big issue
- Hardware is becoming cheaper but enterprise-wide scope results in high complexity and large investment decisions
- IT systems are no longer back office support but key strategic systems with mission critical customer visibility

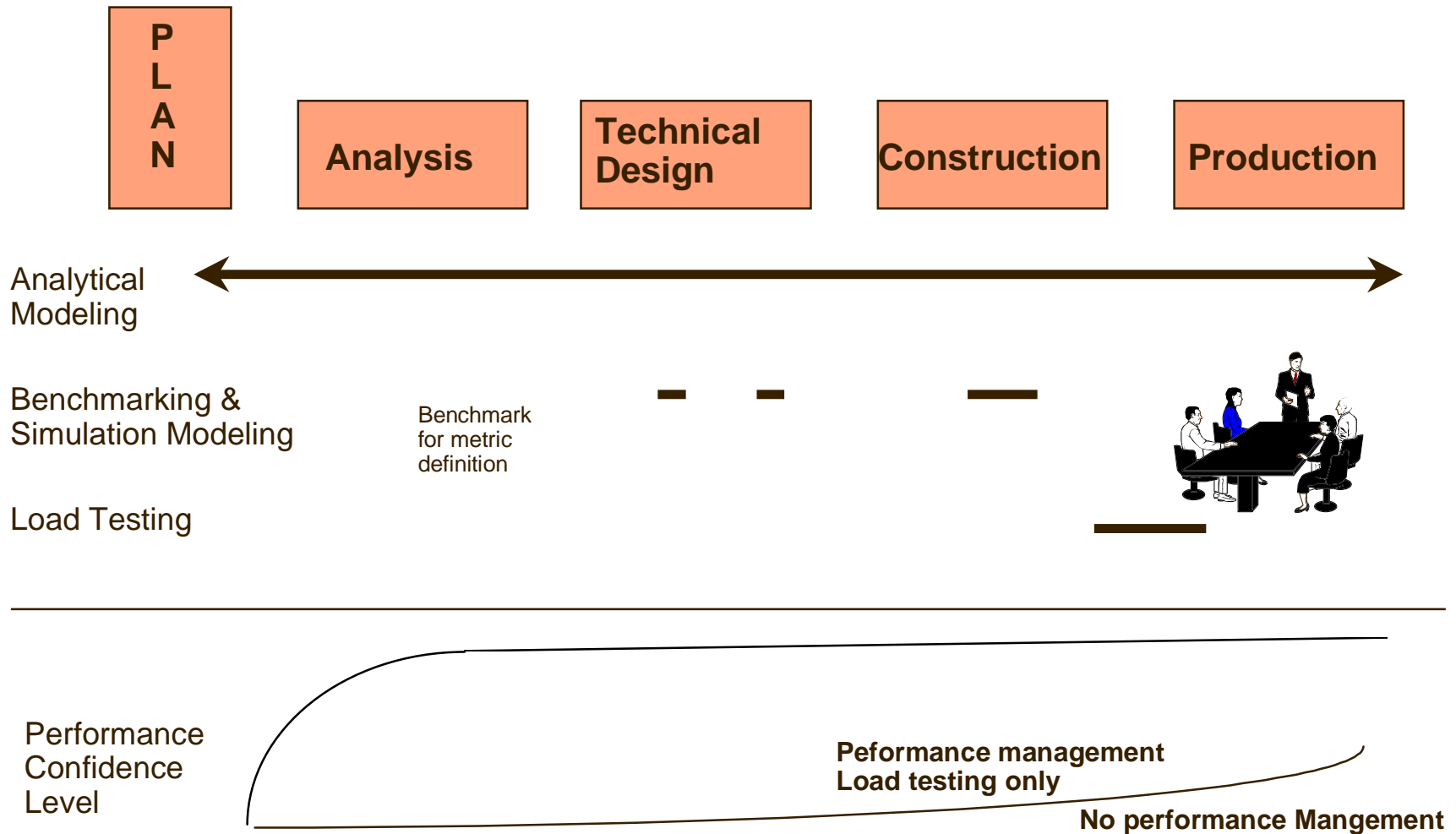


ENTERPRISE MANAGEMENT

- Tivoli, Sun set to merge technologies
- Implementing Unicenter and TME 10 can be hard

PATRICK BURKE, NATIONAL
PROCESSING CO., A
UNICENTER CUSTOMER

Performance Engineering Time Line



Performance Engineering Challenges-1

- **Complexity of the problem**
 - **Pinpointing performance problems in distributed applications can be like -**
“finding a needle in a haystack”
 - **No single tool can detect all the problems because of the large number of components**
 - **hardware, databases, middleware, network**
 - **heterogeneous computing environment**

Performance Engineering Challenges-2

- 0 **Requires an integrated view of the whole enterprise**
 - **which translates to :**
 - **Good understanding of hardware, software, and network**
 - **Access to good performance monitors and the ability to interpret the output**
 - **Ability to understand both the application, user profile, anticipate workloads and then model these into test scripts**

Benefits of Performance Analysis

- **Validation of client/server application design under production user loads**
- **Estimate of user response times for key transactions**
- **Estimate of maximum throughput rates for key transactions**
- **Tuning of application components (eg., database) before application deployment**
- **Resource requirements of individual components (servers, networks, workstations)**

Standard Benchmarks

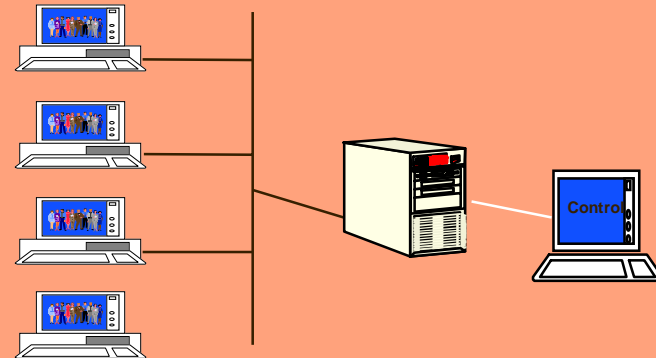
- The traditional benchmarks do not take into account all factors that influence performance
- Transaction Performance Council (TPC)
- Client Server Labs Benchmarks
- AIM
- Neal Nelson's Business Benchmark

Mid-Range Database Server

GOALS

Evaluate the feasibility of using an Intel based Symmetric Multiple Processing system running Windows NT to support multiple applications running on the same hardware

ARCHITECTURE



TECHNICAL ISSUES

- Windows NT
- Symmetric Multiple Processing
- Four applications
- Oracle 7.2
- Multiple Instances of Oracle
- Network monitoring
- Load testing using Load Runner

RESULTS

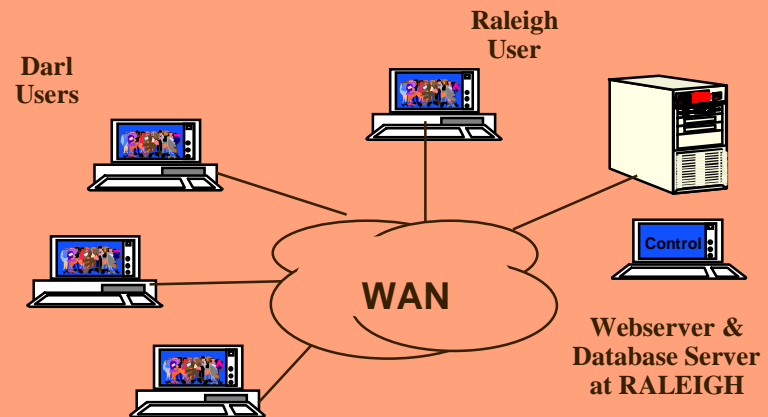
- The hardware/software configuration was adequate to support the anticipated workload.
- Identified potential areas of performance improvement

Application Access Management

GOALS

- Test the ability of the the Web-based workflow management system to support the anticipated workload on the system
- Used for controlling and managing access to enterprise applications
- Replacing the existing paper based system

ARCHITECTURE



TECHNICAL ISSUES

- WWW clients
- Oracle 7.3 and Oracle Web Server
- Internet Security
- Creating virtual users and modeling workflow
- Load testing using Load Runner with web virtual user generator

RESULTS

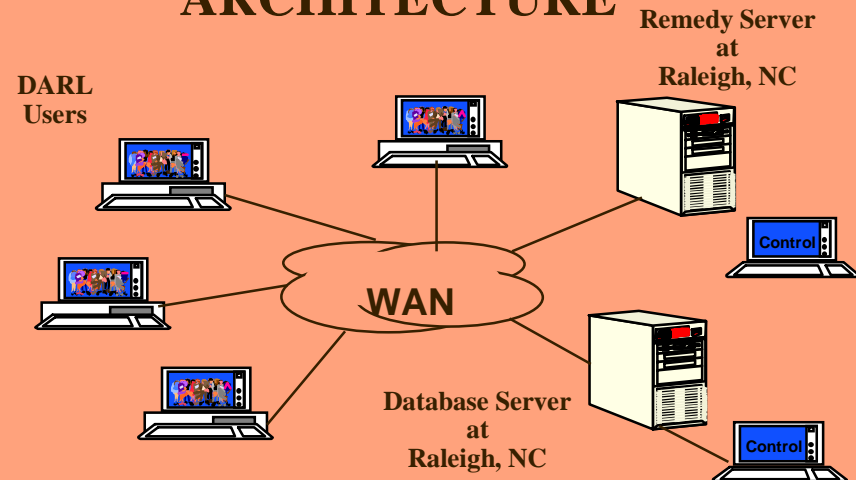
- Found performance problems with Oracle Webserver's ability to support the anticipated workload
- Identified several performance problems with the initial version of the application
- Better management vision for deployment

Help Desk Server

GOALS

Benchmark the a help desk server to support users distributed nationwide

ARCHITECTURE



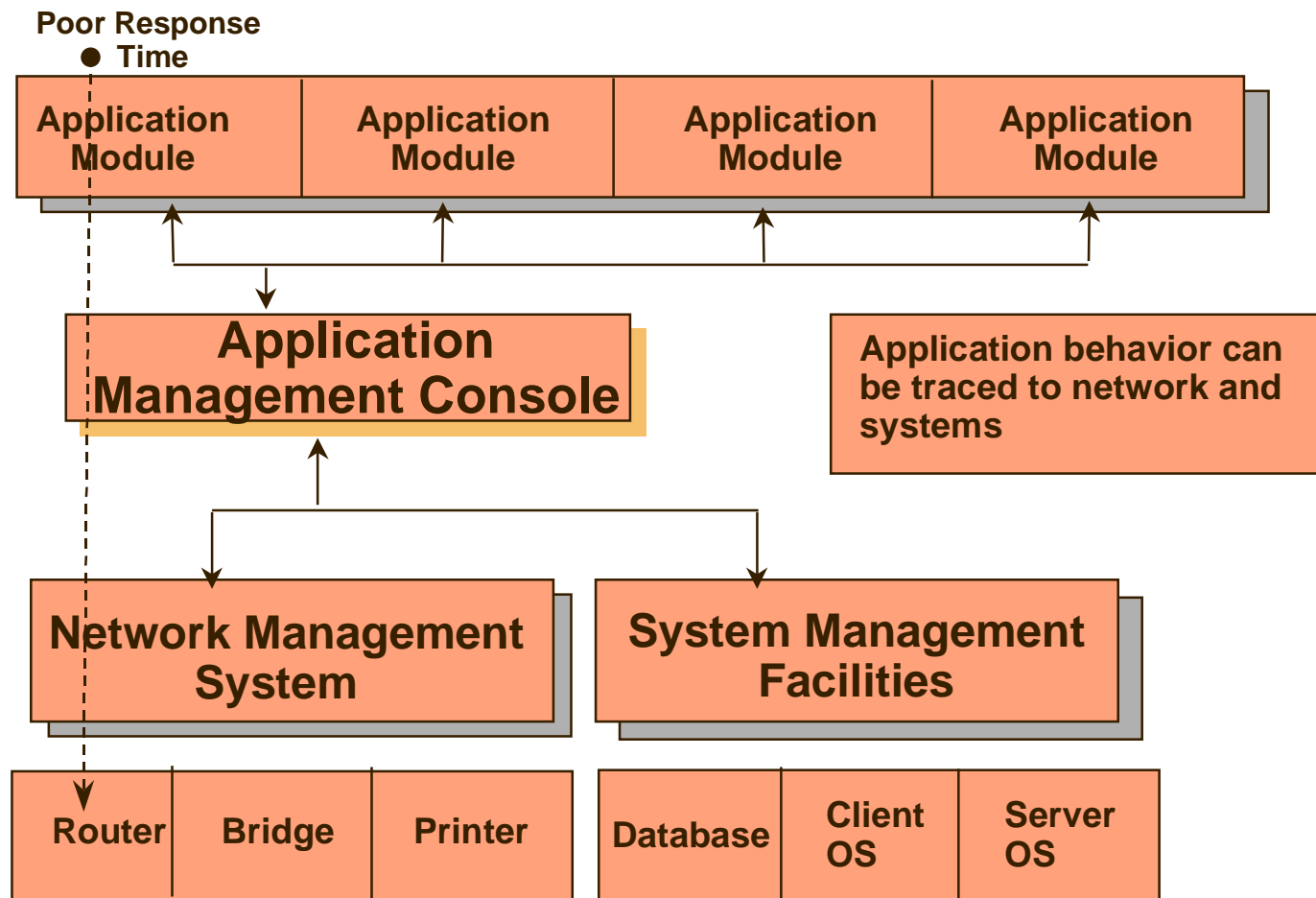
TECHNICAL ISSUES

- **Remedy Action Request System running on a UNIX server**
- **The help desk database on Oracle**
- **Developing virtual user scripts by integrating with the Remedy API's**
- **Simulating and managing remote users at San Mateo, CA and Minneapolis, MN from Mclean, VA**
- **Remote location of the server**

RESULTS

- **Benchmarked the Remedy Server**
- **Detected problems in the configuration of the Remedy server**
- **Demonstrated the effect of network traffic on the performance of the servers**
- **Identified maximum throughput for current configuration**

Application/Component Management



Application/Component Instrumentation

- **Instrumentation of Application/Components**
 - **Special entries in application to record performance of business metrics**
 - **Status recorded in data repository (database, log files, etc)**
 - **Status reviewed for analysis**
- **Approaches to instrumentation**
 - **Windows NT provides Performance Monitoring (PerfMon) Repository**
 - **Microsoft Management Console (MMC) establishes common management framework**
 - **HP Manage X provides active management plug-in to MMC**